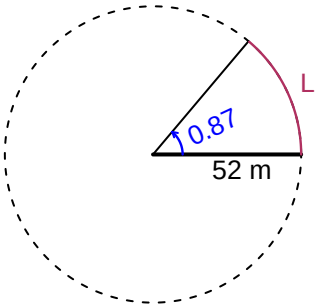
Name: Date:

Trig Final (SLTN v695)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 0.87 radians. The radius is 52 meters. How long is the arc in meters?

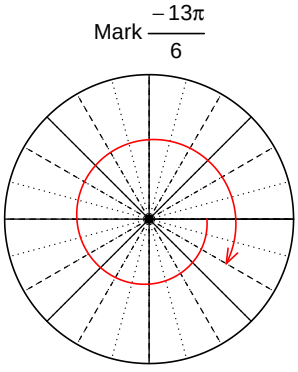


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

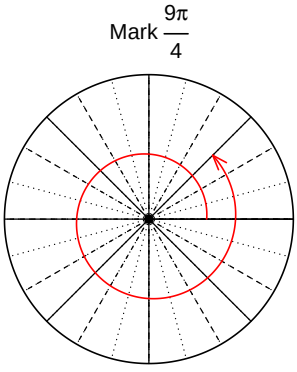
$L = 45.24$ meters.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{6}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/6)$



Find $\cos(9\pi/4)$

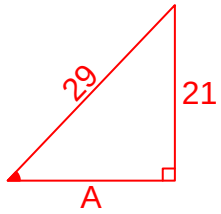
$\sin(-13\pi/6) = \frac{-1}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{21}{29}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

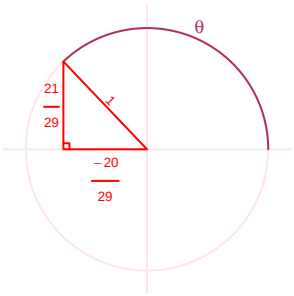
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 21^2 = 29^2$$
$$A = \sqrt{29^2 - 21^2}$$
$$A = 20$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.85 meters, a frequency of 4.85 Hz, and a midline at $y = 3.82$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.85\sin(2\pi 4.85t) + 3.82$$

or

$$y = 7.85\sin(9.7\pi t) + 3.82$$

or

$$y = 7.85\sin(30.47t) + 3.82$$